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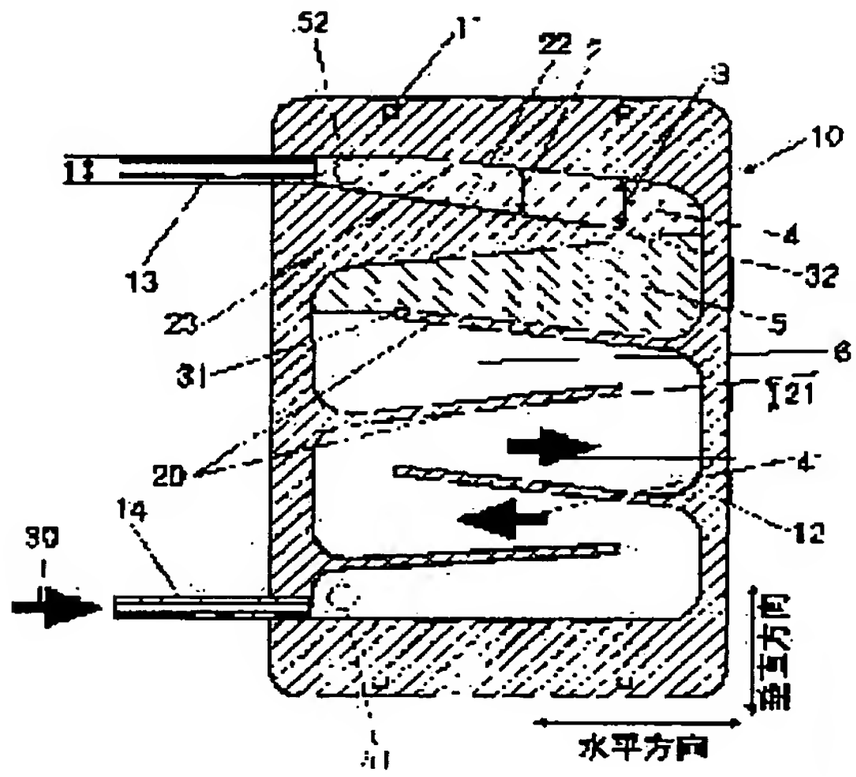
(54) MEDICAL HEAT EXCHANGE BAG

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a heat exchange bag whose inside pressure becomes hardly negative even when a liquid flow rate changes concerning the heat exchange bag to be used for a heater of a blood purifying device or blood dialyzer.

SOLUTION: The medical heat exchange bag to be used for controlling the temperature of the blood or transfusion is provided at least with three meandering parallel passages. The upper part of each of passages are inclined upward relative to the horizontal line in the flowing direction of a liquid, or the upper part of each of passages has an upward inclined portion and a horizontal portion relative to the horizontal line of the flowing direction of the liquid. The lower part of a passage A formed just before an outlet is inclined upward relative to the horizontal line of the flowing direction of the liquid of the lower part of the passage A provided just before the outlet has an upward inclined portion and a horizontal portion relative to the horizontal line of the flowing direction of the liquid.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] In the medical-application heat exchange back used in order to carry out temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the horizontal of the direction where liquid flows, or it is formed so that it may have the part and the level part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows. So that the lower part of the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows The medical-application heat exchange back characterized by being formed so that it may have the part and the level part toward which the lower part of the passage A which is formed or is prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows.
[Claim 2] In the medical-application heat exchange back used in order to carry out temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the horizontal of the direction where liquid flows, or it is formed so that it may have a part for the part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows, and a horizontal level. The medical-application heat exchange back characterized by the die length of the perpendicular direction of the passage A prepared just before an outlet having the relation of (die-length X of the die-length Y<= die-length C<= inlet port of an outlet, die-length X of the die-length Y< inlet port of an outlet).
[Claim 3] The medical-application heat exchange back given in any 1 term of claims 1-2 to which surface ratio of the area P of the passage A prepared just before an outlet and the area Q of the passage B before [one] Passage A is characterized by being the range of P:Q=1:1.2-2.2.

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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the medical-application heat exchange back used in order to carry out temperature control of blood or an infusion solution.
[0002]
[Description of the Prior Art] The medical-application heat exchange back characterized by forming the upper part of each passage meanderingly installed in JP,62-200339,U side by side in the medical-application heat exchange back used in order to carry out temperature control of blood or an infusion solution so that it may receive horizontally and may have dip is indicated.
[0003]
[Problem(s) to be Solved by the Invention] If the temperature of the blood poured into the body or an infusion solution is low, temperature will be easy to be lost and the burden to the body will become large. Therefore, blood or an infusion solution may be warmed and it may be pouring into the body. warming which adjusted the heat exchange back formed so that it might have the passage generally meanderingly installed as a means for adjusting the temperature of the liquid poured into the body to predetermined temperature -- the liquid which flows the inside of the heat exchange back's passage is heated by carrying out a pressure welding to the heater plate of equipment.
[0004] Generally in the equipment for blood purification, or a hemodialyzer, two or more pumps are used. It is possible that the inside of a heat exchange bag becomes negative pressure depending on the service condition of each pump, and the volume in a bag is shortened. thereby -- a heat exchange bag -- warming -- the thermo sensor formed in equipment, especially the thermo sensor formed near the outlet of a heat exchange bag -- contacting -- being hard -- since it becomes impossible that it is hard to sense the temperature of the liquid which flows the inside of the passage of a heat exchange bag, it is possible that the temperature control of a heater plate may become difficult. Therefore, it is possible that the temperature of the blood which flows the heat exchange back's passage, or an infusion solution rises rather than the set point, and is not desirable. this invention -- warming of the equipment for blood purification, a hemodialyzer, etc. -- in the heat exchange back who uses for equipment, the inside of a heat exchange bag cannot become negative pressure easily to change of the amount of liquid flows, the solution temperature in the heat exchange back's passage raises control with laying temperature, and it aims at offering the heat exchange bag which can prevent a temperature rise.
[0005]
[Means for Solving the Problem] In the medical-application heat exchange back used in order that this invention may carry out temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the horizontal of the direction where liquid flows, or it is formed so that it may have the part and the level part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows. So that the lower part of the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows It is related with the medical-application heat exchange back characterized by being formed so that it may have the part and the level part toward which the lower part of the passage A which is formed or is prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows.
[0006] In the medical-application heat exchange back used in order that this invention may carry out temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the

horizontal of the direction where liquid flows, or it is formed so that it may have a part for the part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows, and a horizontal level. The die length of the perpendicular direction of the passage A prepared just before an outlet is related with the medical-application heat exchange back characterized by having the relation of (die-length X of the die-length Y<= die-length C<= inlet port of an outlet, die-length X of the die-length Y< inlet port of an outlet).

[0007] This invention relates to the above-mentioned medical-application heat exchange back to whom the area P of the passage A prepared just before an outlet, the area Q of the passage B before [one] Passage A, and surface ratio are characterized by being the range of P:Q=1:1.2-2.2 preferably.

[0008]

[Embodiment of the Invention] In the medical-application heat exchange back used in order that the medical-application heat exchange back of this invention may do temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the horizontal of the direction where liquid flows, or it is formed so that it may have the part and the level part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows. So that the lower part of the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows He is the medical-application heat exchange back characterized by being formed so that it may have the part and the level part toward which the lower part of the passage A which is formed or is prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows.

[0009] In the medical-application heat exchange back used in order that the medical-application heat exchange back of this invention may do temperature control of blood or an infusion solution Are formed so that it may have three or more passage moved in a zigzag direction and installed and the upper part of each passage may have dip upward to the horizontal of the direction where liquid flows, or it is formed so that it may have a part for the part toward which the upper part of each passage inclines upward to the horizontal of the direction where liquid flows, and a horizontal level. The medical-application heat exchange back characterized by for and (die-length X of the die-length Y<= die-length C<= inlet port of an outlet, die-length X of the die-length Y< inlet port of an outlet) changing in the die-length direction from die-length X of the inlet port of Passage A between die-length Y of an outlet, and die-length C of the perpendicular direction of the passage A prepared just before an outlet having relation is desirable.

[0010] In the medical-application heat exchange back, the die length of the perpendicular direction of Passage A is die length measured in the cross section or sectional view shown in the medical-application heat exchange back's drawing 1 . In the upper part and/or the lower part of passage of the medical-application heat exchange back, it is desirable to have one or more dip chosen upward from straight-line-like dip, convex dip, and concave dip to the horizontal of the direction where liquid flows to have dip upward to the horizontal of the direction where liquid flows.

[0011] In the medical-application heat exchange back used in order that the medical-application heat exchange back of this invention may do temperature control of blood or an infusion solution It is formed so that it may have three or more passage moved in a zigzag direction and installed and may have the part toward which the upper part of the passage A prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows. It is formed so that the upper part of other passage other than the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows. The medical-application heat exchange back characterized by the die length of the perpendicular direction of the passage A prepared just before an outlet having the relation of (die-length X of the die-length Y<= die-length C<= inlet port of an outlet, die-length X of the die-length Y< inlet port of an outlet) is desirable.

[0012] The medical-application heat exchange back of this invention is formed so that it may have the part and the level part toward which the upper part of the passage A prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows. It is formed so that the upper part of other passage except the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows. It is desirable to be formed so that it may have the part and the level part toward which the lower part of the passage A which is formed so that the lower part of the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows, or is prepared just before an outlet inclines upward to the horizontal of the direction where liquid flows.

[0013] As for the medical-application heat-exchange back of this invention, it is desirable to be formed so that it may have the part and the level part toward which the lower part of the passage A prepared just before

an outlet inclines upward to the horizontal of the direction where liquid flows, and to be formed so that the lower part of other passage except the passage A prepared just before an outlet may have dip upward to the horizontal of the direction where liquid flows.
[0014] When, as for the medical-application heat exchange back of this invention, the lower part of the passage A prepared just before an outlet has a level part to the horizontal of the direction where liquid flows, a part for 30% or less of a horizontal level is desirable. When the medical-application heat exchange back of this invention has a level part to the horizontal of the direction where liquid flows [the upper part of the passage A prepared just before an outlet], a part for 30% or less of a horizontal level is desirable.
[0015] As for the medical-application heat-exchange back of this invention, it is desirable to be formed so that the lower part of each passage except the passage which is formed so that it may have the part and the level part toward which the lower part of each passage except the passage prepared just before an inlet port and an outlet inclines upward to the horizontal of the direction where liquid flows, or is prepared just before an inlet port and an outlet may have dip upward to the horizontal of the direction where liquid flows.
[0016] The range of 50 to 250 micrometers, the range of 60 more to 200 micrometers, especially the range of 80 to 150 micrometers have the desirable thickness of the plastic film to be used or a plastic tube, and the range of 100 to 500 micrometers, the range of 120 more to 400 micrometers, and since the range of 160 to 300 micrometers is especially excellent in temperature control, the medical-application heat exchange back of this invention has the medical-application heat exchange back's desirable thickness.
[0017] The medical-application heat exchange back, and the plastic film or plastic tube of this invention to be used To medical care that what is necessary is just plastics, such as usable thermoplasticity For example, halogenation polyolefines, such as a polyvinyl chloride, a polyvinylidene chloride, and polyfluoroethylene, the Pori fluoridation propylene, Polyethylene, polypropylene, an ethylene-alpha olefin copolymer, Polyolefines, such as the Pori 4-methyl pentene -1, a polyamide, polyurethane, Polyester, such as polyethylene terephthalate, polybutylene terephthalate, polycyclohexane terephthalate, polyethylene -2, and 6-naphthalate, etc. can be mentioned, and the film or tube which made these the multilayer can be used.
[0018] warming of liquid whose medical-application heat exchange back of this invention has one or more liquid-sending pumps -- it can use for equipment for blood purification, a hemodialyzer, etc. which formed equipment.
[0019] In a plastic film or a plastic tube, decision is manufactured by the usual approach and, as for the medical-application heat exchange back of this invention, a predetermined configuration and the thing of a dimension are manufactured by carrying out heat welding and attaching an opening member etc. with means, such as heat joining, further.
[0020] Below, the gestalt of operation of this invention is explained in detail per drawing. This invention is not limited only to the gestalt of these operations.
[0021] Drawing 1 is the sectional view of the medical-application heat exchange back 10 who is one example of this invention. The medical-application heat exchange back 10 sticks two polyvinyl chloride films with a thickness of 100 micrometers, the inlet-port tube 14, and the outlet tube 13 by heat joining, and can create them, and the lamination part of the polyvinyl chloride film of two sheets is 12. The medical-application heat exchange back 10 had six passage 6 moved in a zigzag direction and installed including passage B5 before [one] passage A4 and Passage A which are prepared just before an outlet, had the inlet-port tube 14 and the outlet tube 13, and has formed four holes 11 for immobilization. In the medical-application heat exchange back 10, liquid enters from the inlet-port tube 14, is heated in six passage 6 moved in a zigzag direction and installed, and comes out from the outlet tube 13.
[0022] The upper part 20 of other passage except the upper part 23 of the passage A prepared just before an outlet is formed so that it may have dip upward to the horizontal of the direction where liquid flows, and the upper part 23 of passage A4 is formed so that it may have a part for the part which inclines upward to the horizontal of the direction where liquid flows, and a horizontal level. In the upper part of passage, the include angle 21 of the part and horizontal which are formed so that it may have dip upward to the horizontal of the direction where liquid flows has the range of 2 degrees - 15 degrees, and the desirable range of 4 more degrees - 10 degrees. In passage A4 prepared just before an outlet, the die length Y1 of an outlet, the die length C2 of the part except an outlet and an inlet port, and the die length X3 of an inlet port have the relation between (Y<=C<=X and Y<X). The die length X3 of an inlet port shows the die length of the perpendicular direction of the edge (batch edge) of the lower part 22 of Passage A, and the upper part 23, and the die length Y1 of an outlet and the die length C2 of the part except an outlet and an inlet port show the die length of the perpendicular direction of the lower part 22 of Passage A, and the upper part 23.
[0023] As for the surface ratio of the area P of passage A4 and the area Q of passage B5 before [one]

Passage A which are prepared just before an outlet, it is desirable that it is the range of P:Q=1:1.2-2.2. The area P of Passage A is the range of the center section (jump-off line) 32 of the batch section edge of Passage A and Passage B to the outlet tube 13, and the area Q of Passage B is the range of the center section (jump-off line) 31 of the batch edge of Passage A and the passage in front of [of the center section (jump-off line) 32 of the batch edge with Passage B to the passage B] one. A jump-off line is a horizontal line. 41 shows the sense to which the liquid of passage flows.

[0024] The medical-application heat exchange back 10 can be inserted into the hot plate of two sheets which is heating apparatus, and a sink and liquid can be heated for liquid in the back. In heating apparatus, whenever [in installation and the back / solution temperature] is measured for thermo sensors 51 and 52 to two places, the entrance side of liquid, and an outlet side.

[0025] Drawing 2 is the sectional view of the medical-application heat exchange back 100 who is one another example of this invention. The medical-application heat exchange back 100 sticks two polyvinyl chloride films with a thickness of 100 micrometers, the inlet-port tube 114, and the outlet tube 113 by heat joining, and can create them, and the lamination part of the polyvinyl chloride film of two sheets is 112. The medical-application heat exchange back 100 had six passage 106 including the passage B105 before [one] the passage A104 prepared just before an outlet, and Passage A moved in a zigzag direction and installed, had the inlet-port tube 114 and the outlet tube 113, and has formed four holes 111 for immobilization. In the medical-application heat exchange back 100, liquid enters from the inlet-port tube 114, is heated in six passage 106 moved in a zigzag direction and installed, and comes out from the outlet tube 113. The upper part 120 of all passage is formed so that it may incline upward to the horizontal of the direction where liquid flows. In the upper part of passage, the include angle 121 of the part and horizontal which are formed so that it may have dip upward to the horizontal of the direction where liquid flows has the range of 2 degrees - 15 degrees, and the desirable range of 4 more degrees - 10 degrees. In the passage A104 prepared just before an outlet, the die length Y101 of an outlet, the die length C102 of the part except an outlet and an inlet port, and the die length X103 of an inlet port have the relation between (Y<=C<=X and Y<X). The die length X103 of an inlet port shows the die length of the perpendicular direction of the edge (batch edge) of the lower part 122 of Passage A, and the upper part, and the die length Y101 of an outlet and the die length C102 of the part except an outlet and an inlet port show the die length of the perpendicular direction of the lower part 122 of Passage A, and the upper part.

[0026] As for the surface ratio of the area P of the passage A104 prepared just before an outlet, and the area Q of the passage B105 before [one] Passage A, it is desirable that it is the range of P:Q=1:1.2-2.2. The area P of Passage A is the range of the center section 132 of the batch section edge of Passage A and Passage B to the outlet tube 113, and the area Q of Passage B is the range of the center section 131 of the batch edge of Passage A and the passage in front of [of the center section 132 of the batch edge with Passage B to the passage B] one. 141 shows the sense to which the liquid of passage flows.

[0027]

[Effect of the Invention] this invention -- warming of the equipment for blood purification, a hemodialyzer, etc. -- in the heat exchange back who uses for equipment, the inside of a heat exchange bag cannot become negative pressure easily to change of the amount of liquid flows, the solution temperature in the heat exchange back's passage can raise control with laying temperature, and the medical-application heat exchange bag which can prevent a temperature rise can be offered.

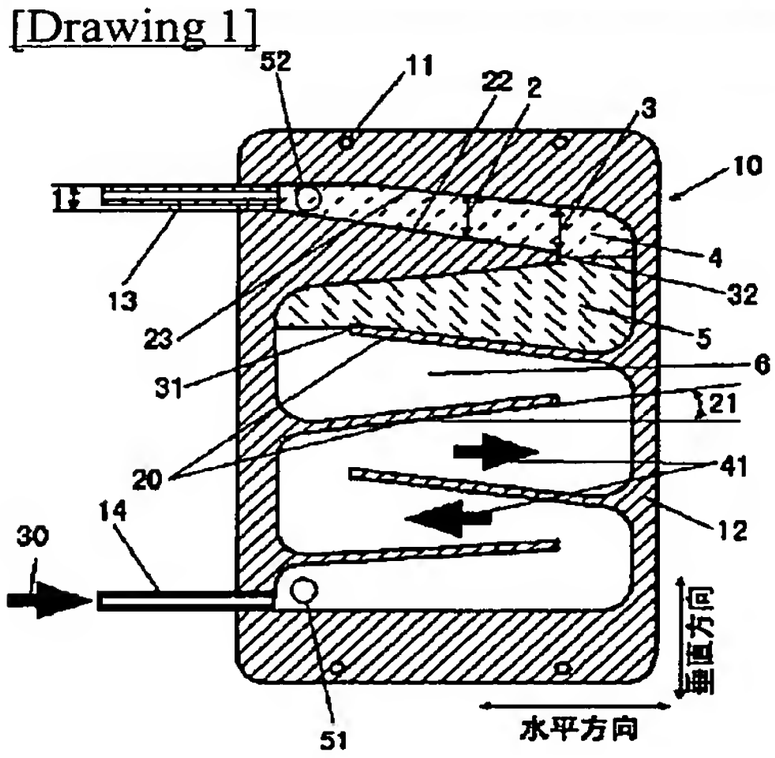
[Translation done.]

* NOTICES *

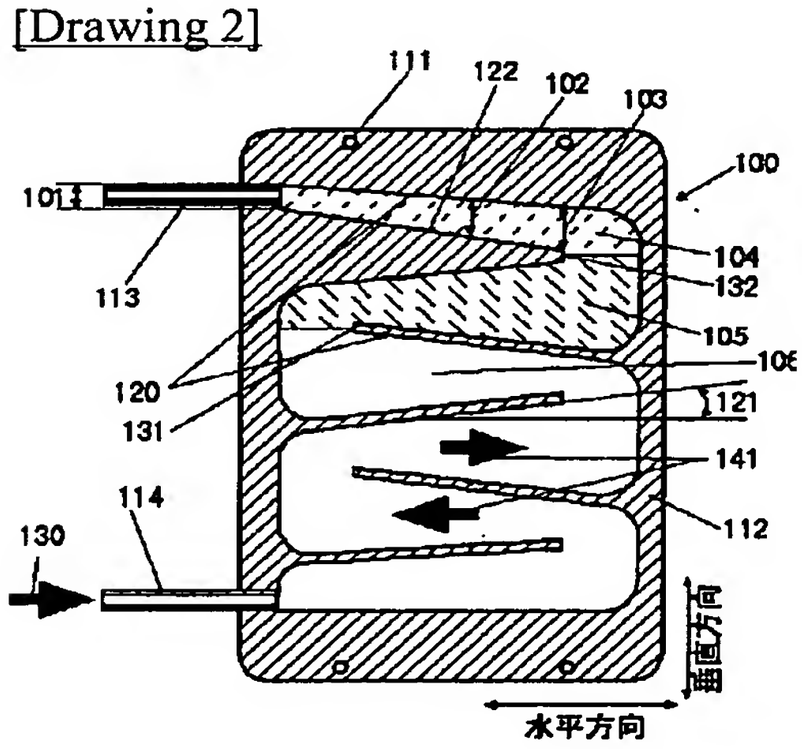
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



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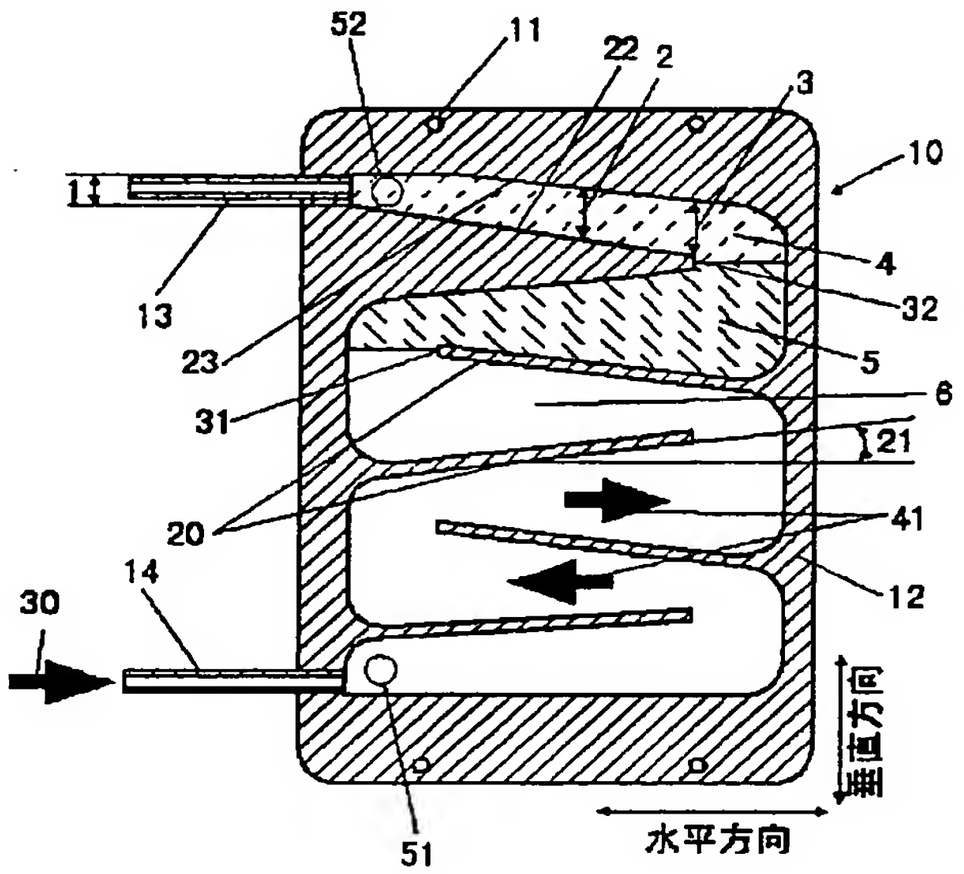
(54)【発明の名称】　医療用熱交換パック

(57)【要約】
【課題】　血液浄化用装置や血液透析装置などの加温装置に用いる熱交換バックにおいて、液流量の変化に対しても熱交換バッグ内が陰圧になりにくい熱交換バッグを提供すること。
【解決手段】　蛇行して並設された３個以上の流路を有し、各々の流路の上部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され又は各々の流路の上部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成され、出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され又は出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成されることを特徴とする血液もしくは輸液の温度調節をするために用いられる医療用熱交換バック。



水平に対して上向きに傾斜を有するように形成され又は各々の流路の上部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成され、出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され又は出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成されることを特徴とする医療用熱交換バックである。

【０００９】本発明の医療用熱交換バックは、血液もしくは輸液の温度調節をするために用いられる医療用熱交換バックにおいて、蛇行して並設された３個以上の流路を有し、各々の流路の上部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され又は各々の流路の上部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平部分を有するように形成され、出口の直前に設けられる流路Ａの垂直方向の長さＣが流路Ａの入口の長さＸから出口の長さＹの間で長さ方向に変化し、かつ（出口の長さＹ≦長さＣ≦入口の長さＸ、出口の長さＹ＜入口の長さＸ）の関係を有することを特徴とする医療用熱交換バックが好ましい。

【００１０】医療用熱交換バックにおいて、流路Ａの垂直方向の長さとは、医療用熱交換バックの図１に示す断面又は断面図において測定される長さのことである。医療用熱交換バックの流路の上部及び／又は下部において、液の流れる方向の水平に対して上向きに傾斜を有するとは、液の流れる方向の水平に対して上向きに直線状の傾斜、凸状の傾斜及び凹状の傾斜から選択される１以上の傾斜を有することが好ましい。

【００１１】本発明の医療用熱交換バックは、血液もしくは輸液の温度調節をするために用いられる医療用熱交換バックにおいて、蛇行して並設された３個以上の流路を有し、出口の直前に設けられる流路Ａの上部が液の流れる方向の水平に対して上向きに傾斜する部分を有するように形成され、出口の直前に設けられる流路Ａ以外の他の流路の上部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され、出口の直前に設けられる流路Ａの垂直方向の長さが（出口の長さＹ≦長さＣ≦入口の長さＸ、出口の長さＹ＜入口の長さＸ）の関係を有することを特徴とする医療用熱交換バックが好ましい。

【００１２】本発明の医療用熱交換バックは、出口の直前に設けられる流路Ａの上部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成され、出口の直前に設けられる流路Ａを除く他の流路の上部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され、出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜を有するように形成され又は出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向き

に傾斜する部分及び水平の部分を有するように形成されることが好ましい。

【００１３】本発明の医療用熱交換バックは、出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成され、出口の直前に設けられる流路Ａを除く他の流路の下部が液の流れる方向の水平に対して上向きに傾斜を有するように形成されることが好ましい。

【００１４】本発明の医療用熱交換バックは、出口の直前に設けられる流路Ａの下部が液の流れる方向の水平に対して水平の部分を有する場合、水平部分は３０％以下が好ましい。本発明の医療用熱交換バックは、出口の直前に設けられる流路Ａの上部が液の流れる方向の水平に対して水平の部分を有する場合、水平部分は３０％以下が好ましい。

【００１５】本発明の医療用熱交換バックは、入口及び出口の直前に設けられる流路を除く各々の流路の下部が液の流れる方向の水平に対して上向きに傾斜する部分及び水平の部分を有するように形成され又は、入口及び出口の直前に設けられる流路を除く各々の流路の下部が液の流れる方向の水平に対して上向きに傾斜を有するように形成されることが好ましい。

【００１６】本発明の医療用熱交換バックは、使用するプラスチックフィルム又はプラスチックチューブの厚みが５０μｍから２５０μｍの範囲、さらに６０μｍから２００μｍの範囲、特に８０μｍから１５０μｍの範囲が好ましく、医療用熱交換バックの厚みが１００μｍから５００μｍの範囲、さらに１２０μｍから４００μｍの範囲、特に１６０μｍから３００μｍの範囲が、温度制御に優れるために好ましい。

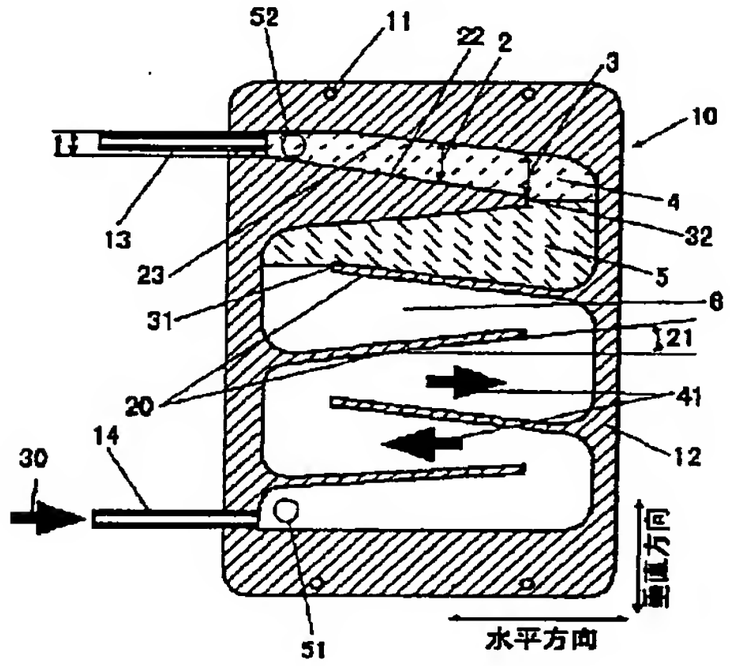
【００１７】本発明の医療用熱交換バックや使用するプラスチックフィルム又はプラスチックチューブは、医療に使用可能な熱可塑性などのプラスチックであればよく、例えば、ポリ塩化ビニルやポリ塩化ビニリデン、ポリ弗化エチレンやポリ弗化プロピレンなどのハロゲン化ポリオレフィン、ポリエチレン、ポリプロピレン、エチレンーαーオレフィン共重合体、ポリ４－メチルペンテンー１などのポリオレフィン、ポリアミド、ポリウレタン、ポリエチレンテレフタレート，ポリブチレンテレフタレート，ポリシクロヘキサンテレフタレート，ポリエチレンー２，６－ナフタレートなどのポリエステルなどを挙げることができ、これらを多層にしたフィルム又はチューブを用いることができる。

【００１８】本発明の医療用熱交換バックは、１以上の送液ポンプを有する液の加温装置を設けた血液浄化用装置や血液透析装置などに用いることが出来る。

【００１９】本発明の医療用熱交換バックは、プラスチックフィルム又はプラスチックチューブを、通常の方法により裁断、熱溶着し、更に口部材などを熱溶着等の手段により取り付けることにより、所定の形状、寸法のも

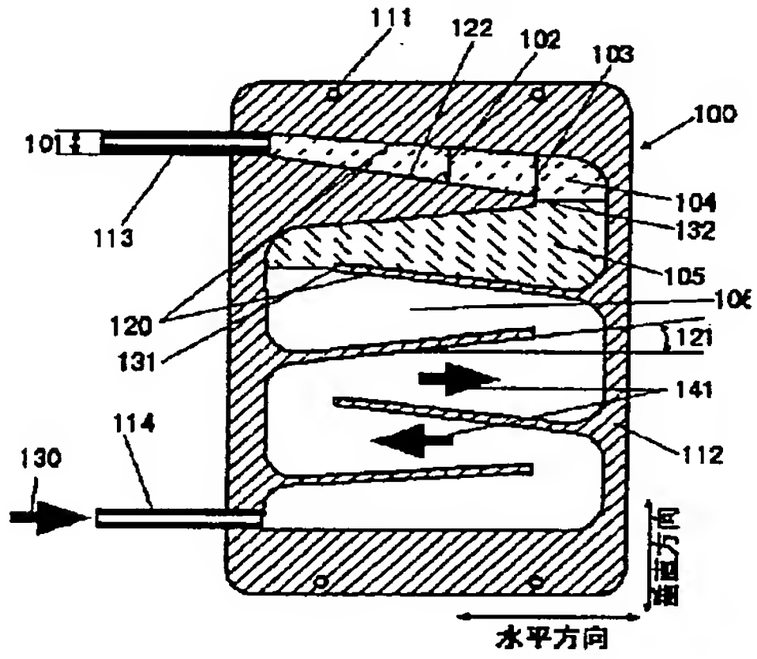
５、１０５：流路Ａのひとつ前の流路Ｂ、
６、１０６：流路、
１０、１００：医療用熱交換バック、
１１、１１１：固定用の穴、
１２、１１２：２枚のフィルムの貼り合わせ部分、
１３、１１３：出口チューブ、
１４、１１４：入口チューブ、
２０、１２０：流路の上部、
２１、１２１：液の流れ方向の水平に対する流路の上部の傾斜角度、

【図１】



＊２２、１２２：流路Ａの下部、
２３：流路Ａの上部、
３０、１３０：液の流れ方向、
３１、１３１：流路Ｂの面積測定のための仕切部（仕切線）、
３２、１３２：流路Ａ及び流路Ｂの面積測定のための仕切部（仕切線）、
４１、１４１：流路の液の流れる向き、
５１：入口側の温度センサー取り付け位置、
５２：出口側の温度センサー取り付け位置。

【図２】



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